SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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RAILWAYS—WHO IS THEIR FATHER?

Powerful to award, too frequently proving itself less equitable than powerful, the world is daily sitting in judgment on the right of precedence claimed by its Worthies. There is certainly no lack of zeal in its adjudication. The merits of the competing excellencies being subjected to the most severe and jealous scrutiny, one from which it must be, in truth, difficult to come forth with all their honours thick about them, or, to recur to our *Alma mater* phraseology, not "plucked," if the sequence here points the moral; for while aspirants—thanks to the point of progress human intelligence, and her handmaid, human industry, have arrived at—so numerous, admissions to the highest places have been marvellously few. However, scrupulous caution in a matter of such moment to literature and science is commendable; but here our admiration ends, for the plain reason, that the extreme to which the conservative virtue is strained, has, in creating obstructions to the ambition of struggling genius, retarded the advancement of moral and mental worthiness, which if encouraged had reached a glorious maturity. How many thousands of men of genius have been left to sink exhausted upon, or compelled to turn despairingly from, the upward way. Our palm-bearing circle is too rigidly and, therefore, unjustly circumscribed; an opinion strengthened by the fact that the decisions which have accorded the highest elevation to the few are in *several* instances among that few obnoxious to those attaints which would represent at this moment the International distribution of prizes as an international delusion. Centralisation is here grievously at fault. In this the wise ones of the world have, as they have done from time immemorial whenever they attempted to officiate in the Temple of Minerva, and crown the brows of her votaries, committed some sad mistakes. Of course, it is but just to allow them the consolatory plea, that erring they did wrong with a good intention. Something is certainly wrong in the great machine somewhere, but there is now no time to tell how some screws have wormed themselves into wrong places—why these bolts have shot so falsely, or those supply such questionable and inadequate support; and, finally, how certain parts are so thoroughly inadapted to the uses assigned them. No doubt there exists very considerable difficulty in inducing among philosophers, being absorbed in abstruse consideration of mighty subjects, that self-compulsion necessary to bring them down from their scientific stilts, and seat them on lowly trivets for a microscopic squint at ingenious minutiæ. People in the habit of looking from eminence on expanse are, unfortunately, over apt to forget there is a great mind in little people and little matters—nay, that there are those dwelling within the dense and gloomy shadows of the world they look forth upon to whom some of its noblest structures and most brilliant utilisations are originally attributable. It would be well were there more attention bestowed upon this latter evidence of our national short-sightedness. Manipulators who successfully materialise the scientific conceptions of others are more honoured among us than originators, whose genius first traced the form and prescribed its uses. Carried away by enthusiasm towards all capable of being profitably employed in our service, we are ever grasping the hand of him who last added to the power of contrivance, and stoically "remember to forget" in our dispensation of material benefits those by whom the first force of invention was created.

Nevertheless, from the man who moulded the original clay-pipe to him who designed the Boxmoor Tunnel, and lifted by his intelligence the tubular bridge to its mighty and leviathan application, every originator has a claim, if not a legal, claim on national consideration; and no right-minded, thinking man, desirous of doing unto his neighbour, as the Deified Teacher so simply, yet sublimely, inculcates, can be slow in accepting the obligation. A wide span it must be acknowledged exists in one's natural appreciation of the clay-pipe and the great steam-transit tube as representatives of scientific construction; and were we to enter upon a comparative estimate of their individual merits, it would not be surprising to find very well-intentioned people flinging round with a sneer from such analysis. Comparisons of these would be voted odious—ridiculous; yet what is the consequence of all this supercilious inattention? The habit that on the one hand makes men forget that the tube and bowl which bring the fragrant weed a daily contributor to their comfort, ever had a constructive thought expended upon it, leads them on the other to listlessly concede the credit of originality to the achiever of every scientific success. And if matters go on thus, apathy in regard to the memorial rights of science will rest dull as Lethe's wave on the mind; so that when, a hundred years hence, the tubular bridge requires repairs, the patcher of that present will receive all the popular plaudits and ovations due to the illustrious projector of the past. Of course, the idea of such an eventuality occurring at any given time within the next thousand cycles will be as readily and recklessly scouted as would certainly have been the foregoing suggestion; but what will our positives and negatives—in a word, the whole *genus omne* of our social gnostics—say when they learn the existence among them at the present day of an aged gentleman, highly and deservedly respected in the seclusion to which his limited fortunes—nay, his adverse destinies—have doomed him, who is the lineal representative of that man who designed the first British railway—rather, it may be averred, the very first railway; indeed, the credit and universality of the great emprise conception for rapid transit cannot be wrested from him, inasmuch as the well-authenticated proofs laid before speak incontrovertibly to the fact of his having been the author of that original comibeneficent scheme for converting the common tramroad into a highway for conveying passengers. But the simple assertion of his claim to the first creative thought of this, the vastest of human constructions, is not our only object. The motives which prompt our re-opening this question of scientific precedence are far beyond consideration for the memory of departed genius, or the individual interest of any one living being. A great principle is involved in the present adjustment of the disputed claims of super notice, as while thereby justice will be done to those who are no more, a recurrence of injustice will be prevented in the future, and upon the minds of the times we live in will be impressed the moral warning and assurance that a rapacious appropriation of the honours and credit justly belonging to another cannot remain an invested property in any man, no matter to how much wealth and influence his position may be supported; but that time, although years may enfold facts in obscurity, will search them out, and by them test the heir-loom and its devisor.

Much injury has resulted in the thoughtless adhesion of the public of this country to the false doctrine that the success of the practical man of business stamps him as the original designer of that which has ensured his triumph. It is notorious that ruin and beggary have been the lot of most of those cabinet scientific men whose silent studies organised the existence of "projects" from which the world reaps its most sterling and enduring benefits; and while affluence surrounds the families of the secondary or material workers out of design, the children of those whose high creative intelligence planned out of thought the most massive and intricate aids of commerce are lost to the world in their misery. Pursuing the nationally interesting enquiry, we would, without prejudice or favour, lead to a solution of the question, "Who was the originator—who the father of railroads?" The name of George Stephenson will, no doubt, be the first to suggest itself to the great mass of English people, who have fallen into the error already discussed of decreeing to that most successful, most naturally gifted, and most persevering scientific imitator of, and improver upon, the designs of others of his time the palm for origination of the system of iron arteries, by which from heart and head, over surface and to the farthest extremities of the land, the industrial sustenance has been conveyed, ever enriching as it flows, ever strengthening its principles in progress, and maturing its utilities on extension. Another name, however, enters into competition for the great prize, that of William James; and it is not too rapidly prejudging the competitive claims to assert that the modest entablature from which it has been transferred to these columns had long since been displaced by a national monumental tribute to the memory of the person who so honourably bore it, and, more, the right man in the estimation of the English nation, on the matter before us, would have been now in the right place, had the plea here recorded been at an earlier period submitted to the public. The simple annal best suits the plain, matter-of-fact, practical character of this departed and—shame to say it—almost forgotten British worthy. But it is never too late to correct an abuse or fulfil an act of justice. The *origo viæ ferratæ* is now to be sought for.

Nearly a century has passed—an age of the most marvellous social transition and transmutation—since to William James, Esq., of Sully and Henley-in-Arden, a magistrate of the county of Gloucester, was born a son, who was named after his father, and in due time educated at Warwick and Winsor-green Schools. Possessing talents of no common order, young James was destined to the study of the law, and commenced his student-ship in London, where he soon distinguished himself among his compeers, rivalling the best in forensic acquirements, particularly in a fluent aptitude for discusion, and rendering himself, by his assiduity and steadiness, a worthy example to all.

Perhaps no better proof of his moral and intellectual influence can be advanced, than to state that at a very early period of his career he became Master of a Freemason's Lodge, a position never arrived at by any person devoid of those principles and qualifications which elevate the man and constitute the gentleman. In his profession he soon became eminent, and having applied himself energetically to the business of land agency, was not long before he won the confidence of those he was employed by, among whom was Lord Warwick, who, in October, 1798, appointed him his deputy Recorder of Warwick, "Confident," to use his lordship's words, "of his *ability to be of public service.*" William James was then in his twenty-seventh year. Nor did this choice disappoint his noble patron. Zealously discharging the duties of his new office, without the slightest religious or political bias, James attracted the consideration and secured the respect of not only the community among whom he resided, but of some of the most exalted personages of the period, for in 1801 we find Lord Warwick writes—"His Royal Highness the Duke of York has laid your name before His Majesty for his approbation," an intimation, doubtlessly, referring to his commission as major-commandant of the Warwick volunteers, a corps organised by him at a very serious expenditure to himself of time and money. Further, it appears his exalted friends and noble clientelle were about this time a very numerous and puissant body. The Dukes of Northumberland, Norfolk, and Marlborough, the Marquis of Headfort, Bishop of Bath and Wells, Duchess of Dorset, Lords Whitworth, Willoughby-de-Broke, Dartmouth, Thurlow, Clifden, Holland, Spencer, St. John, Donegal, Redesdale, with Mr. Vansittart, Miss Plumtree, and many of the most wealthy commoners of the country, held him in highest estimation, favoured him with the most friendly intercourse, and "placed great reliance upon his judgment, in respect both to the value and management of mineral as well as landed property."

In 1804 William James projected the drainage of Lambeth Marsh, the surveying and levelling having been specially directed by the then Prince of Wales and the Archbishop of Canterbury. The bridge now known as Waterloo Bridge was an element of his plan, but the indicated site was different from that now occupied, and involved on the Middlesex side new streets which, if now in existence, would be an essential improvement to the metropolis. At his own expense a line of turnpike-road was projected and surveyed by him from Warwick, through Buckingham, to London; and to his intelligence and energy the West Bromwich coal field, in Staffordshire, owes its earliest development, he having established therein, at an immense personal outlay, the Ballshill and Golden Hill Collieries. About this time he became proprietor of several other collieries throughout the country, which may be enumerated as follows:—Ochrehill, Leebrook, and New Contract; the Birchill Colliery and Ironworks; the Pelsall Colliery; Swadencote Colliery, in Derbyshire; Wyken Colliery, near Coventry, in Warwickshire; all worked with his own capital. The Clutton Mines, in Somersetshire, he managed at the same time for the Lord Warwick; and joined with Lord Whitworth, the Duchess of Dorset, and Mr. Vansittart, and some others, in extensive trials for coals at Bexhill, where, after an expenditure of 30,000*l.*, the works had to be abandoned on account of the overpowering influx of water. Justice to so energetic a public servitor induces our special mention of those extensive and ponderous mineral exploitations and workings. Even at this stage of his career the transactions he engaged in merit a grateful recognition from all interested in the greatest industry of the country. Neither were those who then witnessed his display of skill and spirited perseverance unsusceptible of an appreciation, the evincement of which did him and themselves the highest credit, for in 1816 James was elected Chairman of the Coalmasters' Meetings, at West Bromwich; and "having done so much for the interests of that trade, by the discovery of mines, its promotion generally, and by his evidence before Parliament, it was suggested by several capitalists to present him with a suitable acknowledgment of their gratitude."

This ovation was, however, with James's characteristic self-denial, thankfully declined. Inclosure of waste lands upon a large scale—those of Hounslow, Isleworth, and Dulwich stand here the most prominently forth in our retrospect—occupied the Briarean armed industry of this able and untiring projector, while a coexistent duty devolved upon him in his entire superintendence of the Stratford-upon-Avon Canal, an enterprise wherein he had invested no less a sum than 20,000*l.*, and was deputy-chairman of the company that carried out the undertaking. Nor did he rest here; for having purchased the principal tonnages of the River Avon from Stratford, Evesham, and Tewkesbury, he laid out between 6000*l.* and 7000*l.* to improve its navigation. And now it would appear the prosperity of William James was culminating to its highest point. By the purchase of the Snowford estate of nearly 1000 acres, together with its manor, situated in Warwickshire, the Trebenshun property in South Wales, of about 700 acres, and a valuable possession of land and houses in Warwick, he became incorporated with the most influential landed proprietary of the kingdom, realising at the same time more than 10,000*l.* a year by his profession. Thus, in 1812, his star was brilliantly in the ascendant. Upon a close estimate he was then worth, independent of all professional gains, upwards of 150,000*l.*; but with the "turn in the times" consequent on the great political crisis which soon after occurred, fortune became capricious. Some severe mining losses were the first lourings of adversity; yet why should we so recklessly attaint fortune? William James owed many of the ills that came upon him to a too sanguine and too generous disposition. Naturally of an independent spirit, prosperity rendered him bolder in his confidence in others, more enthusiastic in his ambition to excel all in promoting the advancement of mining industry, upon which he cherished the conviction the whole industrial success of England depended, and—here we would, if possible, draw a veil over our own suspicions—too high spirited to modify circumstances by a politic concession to the opinions of those who, he inclined to think, were, while grasping his hand and smiling blandly upon him, "cutting the ground from beneath his feet," firmness merged into settled obduracy. But his kindly sympathies leaned to those of others—his unsophisticated sincerity was ever seeking for its fellow in the many, when his experience should have indicated that it only dwelled among the few. His errors, in the aggregate, were only those of his class and of his day; but of those one might particularise it might be indited William James was humble only in the zenith of his prosperity—proud, haughty, and uncompromising in the gloomy abyss of misfortune, unforgiving to those by whom he had been once deceived, and perhaps improvident in speculation—trusting too freely to chance—when the decadence of his fortunes commenced. Of him may be said with truth that he never injured anyone of those with whom he became connected in business; that evil in favour of others, and in the abandonment of his generosity, he only inflicted on him and his. The *munificentia animi* was at once his vice and his virtue.

[*To be concluded in next week's Journal.*]

GOVERNMENT INSPECTION OF MINES.

THE INSPECTORS' REPORTS.

[*Concluded from last week's Mining Journal.*]

Mr. Charles Morton (Yorkshire district) reports that, although the loss of life in the coal mines of Yorkshire in 1861 was, unhappily, rather heavier than in 1860, it is yet consoling to know that it is 31 per cent. less than the average coal mining mortality of the previous ten years in that county. It is also gratifying to observe that although the number of working collieries in Yorkshire has augmented during the last eleven years from 260 to 390 (being an increase of 50 per cent.), and although the annual production of coal during the same period has advanced from 6¾ millions to 9¼ millions of tons, being an increase of 37 per cent., yet the number of deaths has diminished from 106 in 1851, to 55 in 1861, being a decrease of 48 per cent. He has to announce, with satisfaction and thankfulness, that the Yorkshire mines have not been visited by any very appalling or devastating calamity (as regards loss of life) during the past year; but he has still abundant reason to regret that, by the lamentable occurrence of 65 separate accidents, 60 unfortunate persons were killed; that is to say, at the collieries there were 55 deaths, at the ironstone mines there were 7 deaths, and in experimental or trial shafts (usually called "new sinking pits") there were seven other deaths. The sacrifice of human life occasioned by the prevalence of noxious gases in coal mines was smaller last year than it was in either of the two preceding years; and he has again to report that in every fatal case of explosion the gas was kindled either by the imprudent use of naked lights, or by the indiscriminate blasting of coal with gunpowder. The mortal injuries originating from falls of roof and other mineral in the underground roads and working places of collieries and ironstone pits, are still so numerous as to demand the most earnest attention and careful vigilance of agents and their subordinate officers, with a view to inculcate, and if needful even to enforce, greater caution on the part of the labourers. He has also the painful duty to relate that the unexpected ignition of gunpowder in mines has caused not less than six deaths in the twelve months. These are chiefly attributable to the indiscreet use of iron rammers, instead of copper or wood ones, when preparing "shots," and to the dangerous practice of drilling out shots which had missed fire. The fatal casualties that have happened in shafts are mainly owing to imperfections in and improper working of the drawing machinery, to a disregard of established signals, and to neglect of the general rule which requires that the sides of shafts should be securely cased or lined. Aided by the more comprehensive provisions of the new Mining Act, he is now enabled to give a return of non-fatal accidents in and about collieries and ironstone pits, and of the number of persons injured thereby. Under the old Mining Acts such statistics were not ascertainable. In Yorkshire 115 persons were more or less seriously wounded, though not mortally, by the occurrence of 86 separate accidents during the year 1861. On analysing the sad catalogue, it appears that 42 persons were burnt, but not killed, by explosions of fire-damp; 36 persons were lamed and crushed under falls of roof and coal; 10 persons were run over by corves on underground tramways; 10 persons were dashed down pits, or dragged over pit pullies, but miraculously escaped with their lives; 6 persons were maimed by explosions of gunpowder; 3 persons were bruised by machinery; 1 person was scalded by a boiler bursting; and 7 others were much hurt by mishaps of a miscellaneous character. Whether this gloomy list is heavier or lighter than heretofore he knows not, owing to the fact that there has not previously been any authorised or accurate method of registering such misfortunes. As regards the seven explosions of fire-damp which involved death, and the eighteen or twenty explosions which were not fatal, it is important to remember that not one arose from the safety-lamp, and the whole of them might have been avoided, excepting a solitary instance, if locked safety-lamps had been employed instead of naked lights, and if blasting powder had not been almost recklessly used in fiery places. The educational clauses have, upon the whole, worked well in his district.

Mr. Hedley (Derbyshire, Nottinghamshire, Leicestershire, and Warwickshire district) reports that in his district there were three deaths from explosions of gas, and that many discharges of large bodies of gas at the Shipley hard coal colliery, near Derby, have safely passed away by proper use of safety-lamps. Recently another large discharge, which filled a district of the mine with explosive gas more than two hours, passed harmless away. There was a current of air passing at the rate of 6 ft. per second through the workings at the time. A defective lamp, or an exposed light, would have caused a fearful explosion. During the year he had advised the exclusive use of safety-lamps at two collieries. At one the gas in the goaf was liable to be driven out by large falls of the roof, which is strong, and comes down in great masses. The other is a colliery with a single-bratticed shaft, recently sunk to a fiery seam, the character of the issue of gas not being fully proved. It is only right to state that a second shaft had been some time in progress. Twenty-three deaths from suffocation through an inundation of water, and 21 deaths from falls of coal and of roof. Although there has been an increase of 50 per cent. in the quantity of coal raised since 1855, there has been no increase in the loss of life from falls of coal and roof. The shafts accidents, he regrets to say, are more numerous than they ought to be—in all 15. Considering that, with about seven exceptions, the shafts in his district are fitted with guides and cages, the loss of lives in shafts is large. During the past year he has directed his attention to this class of accidents, in order to reduce the number. He trusts that the steps taken will result in a more favourable return for 1862. Men doing repairs in shafts will not take the precaution to secure themselves, either by strong straps or chains, to the rope or the cage. A blow missed with the hammer, the slipping of a spanner in screwing up nuts, or the slipping of a lever, plunges the poor man headlong down the shaft. He has repeatedly suggested

the security of a fastening as above, but it is only looked upon as a whim. Two deaths occurred from falling from the surface when engaged at their duty of banking: gates or fencing raised by the cage would have prevented this loss of life. He had pointed out at these collieries the necessity of such fencing. It is only right to state that at one of the collieries the accident happened before the fence could be applied. Five deaths from being run over and crushed by trams in the mine; this class of accidents has not increased during the past six years. Two deaths miscellaneous, one struck with a broken pump-rod when changing a bucket; the other was dragged down an incline by a loaded tram. The tram caught his clothes as he attempted to stop it running, and dragged him some distance. Six non-fatal explosions of gas had been reported to him during the year, slightly burning 12 persons; he inspected the collieries immediately after receiving the reports, and made suggestions, which if attended to will prevent like occurrences. Ninety non-fatal accidents from other causes had been reported to him during the year, by which 102 persons have been injured, but not permanently. In visits made to enquire into the cause of these accidents, he has found many suggestions necessary in order to secure future safety. It has been the practice in the midland counties for the stall men (the men who contract to get and deliver coal or ironstone into the main road, from lengths of face varying from 100 up to 60 yards) to go early to work, leave the pit at 2 or 3 o'clock in the afternoon, and frequently leaving only inexperienced men in the stalls. Many accidents have occurred after the stall men left the mine. In the revised special rules last year he introduced a rule, that when the stall is at work one of the stall men must attend, in order to see to the security of the stall and safety of the workmen. As this new rule interfered with an old-established practice, there has been some difficulty in getting the men to conform to it. In ironstone mines the loss of life is much greater than it ought to be, being at least 50 per cent. more than in the coal mines. Mr. Hedley trusts that the provisions of the Act will reduce the loss considerably. There is generally laxity in conducting ironstone mining operations, an inferior class of workmen being employed to those in coal mines. The application of the Mines Inspection Act to a part of the ironstone mines is an anomaly which should not exist—the whole should be included. The dangerous state of many shafts (not under the Act) from being uncased is a fruitful source of accidents. The system of working ironstone mines by contractors on a more extended scale than in coal mines renders it necessary that discipline should be enforced at every mine.

Mr. WYNNE (North Staffordshire, Cheshire, and Shropshire district) remarks that in former reports he has spoken of the skill and care displayed by the Shropshire colliers, and of the freedom from accidents consequent thereon, but he is sorry to say the last year's list does not call upon him to repeat his commendations, as it is the only portion of his district showing an increase, and this is owing in a great measure to the lax discipline the underlookers have allowed both on the bank and in the underground workings, and which ought to be remedied, and during the past year he has had to perform that most disagreeable of all his duties—to appear in the magistrates' courts to prosecute for violation of the rules, more frequently in Shropshire than in any other portion of his district. In North Staffordshire he has to record a decrease of 18 deaths, owing mainly to the strict carrying out of the new special rules which the proprietors and managers have determined to carry out; but the most cheering fact is that in Cheshire upwards of a million tons of coal were raised with the loss of only two lives, although the deepest coal pit in the kingdom is in that county. In reporting upon explosions for the year 1860, he said the comparatively small number of 13 ought to be reduced, and would be if the parties in charge of the mines could be brought to a true sense of their responsibility, and see the necessity of obeying the rules themselves, and making every man under them to do so. This rather sanguine view of the subject has been realised, and much to the credit of all parties concerned, inasmuch as only three lives have been lost from explosions of fire-damp during the past year. In some collieries, where non-fatal explosions have occurred through carelessness on the part of the men, a warning has been given by the manager that if such a thing should happen again he should order safety-lamps alone to be used, has had a good effect, for where lamps have not yet been introduced there still exists a great prejudice against the adoption of them. With respect to the accidents from falls of roof and coal, Mr. Wynne remarks that it has always been his opinion that propping and spragging ought not to be left to the will or caprice of the workmen themselves, and the result of last year's experience confirms that opinion, for at collieries where a well regulated system of timbering is enforced, scarcely a life has been lost, and it cannot be too often or too strongly impressed on the minds of all parties concerned in mining that the more timber is used the less is lost, and that the most profitable way of working coal is to work it with safety. Any person who has spent much time in a coal pit must have noticed how difficult it is to convince an old collier that the danger the loader runs is far greater than that of the collier, and as charter-masters are generally taken from this class nothing but the most stringent rules, strictly enforced, will ever make the colliers secure the roof before the loaders are allowed to work under it. It is almost useless to supply the men with timber if there be no one employed to see to the proper application of it. Although the number of deaths is reduced from 22 to 14, there is still room for further improvement, which can only be brought about by strict discipline and the enforcement of such rules as are laid down for the guidance of the workmen by their employers, who have a right to expect obedience from their men when the sole aim and object can be no other than the safety of human life. Shaft accidents is one of those prolific causes of danger that so far as his district is concerned, will continue until legislation is brought to bear on the subject, and the present rude method of winding minerals be put down by a stringent general rule prohibiting the present mode of lowering and raising men, and substituting in its stead the use of guides in every pit. To some this would seem a great hardship, but no coal-owner would regret the adoption of guides after once applying them to his pits, and the silly prejudice against innovation had worn off. Miscellaneous accidents underground have been few, and of such a nature that call for no remark, for it is vain to suppose that a dangerous occupation like that of mining can be carried on without accidents. It is consolatory to find there has been no death by suffocation, which goes far to prove that, taken in conjunction with the decrease in explosions, there is more attention paid than formerly to the ventilation of mines. Accidents on inclines are two in number, and, as he said last year, can hardly be expected to be less, but he finds the refuge stalls by the sides of inclines have been the means of saving several lives. The educational clauses of the Mines Inspection Act are not working so well as he could wish, as many masters have dismissed all boys under 12 years of age rather than be troubled about the certificates, and where they cannot dispense with boys, great inconvenience arises from parents objecting to their children going to school for two hours after doing a hard day's work. And again, at Christmas and Midsummer the boys cannot go to work for some time, being without a certificate, owing to there being no school for them to go to during the holidays, but he must say there is quite as much anxiety on the part of the masters to carry out the law as there is on the part of parents generally. This is owing in some measure to the nonsensical teaching in some schools, where, instead of confining their attention to reading and writing, which would enable every boy to acquire further knowledge if he wished to do so, their time is taken up with grammar and geography and such like. One old collier told Mr. Wynne that his lad knew exactly how far it was from London to Constantinople, but he did not know how far it was to the next village. If schoolmasters would confine their teaching to plain reading and writing, the objection that now exists to night schools or evening schools would soon disappear.

Mr. BAKER (South Staffordshire and Worcestershire district) reports that there has been a gradual decrease in the deaths in his district since the inspection of coal mines first commenced, and this decrease is most marked in the class of accidents which occasion the greatest number of deaths in his district—namely, falls; and the deaths from explosions and from accidents in shafts also show a decline. Of the whole, 134 deaths from fatal accidents in the coal mines of South Staffordshire and Worcestershire in 1861 no less than 78, or considerably more than half, arise from falls of coal and roof. In the coal-bearing strata of this district, from the great extent to which they have undergone contortion and structural division, the miners are peculiarly liable to such accidents. In ordinary cases a more abundant and judicious use of timber, and careful attention to spragging, spurning, and cogging the coal whilst holing and cutting, would greatly reduce the number of such accidents. But in the extensive seams of the ten-yard (or thick coal), and the new-mine and fire-clay strata, worked from 10 to 14 ft. in thickness, which are ordinarily got by one operation, the great height renders it impracticable to support the roof with timber props, unless these seams are worked in two or more divisions on the long-wall system. In the case of the thick coal measures, too, the natural disturbance of the strata has been considerably increased over a large portion of the district, where the first operations for their extraction having been completed; the residue remains in the shape of ribs and pillars, which are usually found in the subsequent working of what are termed rib and pillar pits, to be greatly crushed and dislocated by the subsidence of the superincumbent strata, occasioned by the first getting of the whole coal. Of the 78 deaths from falls of coal and roof no less than 43 took place in the thick coal and 19 in the new-mine and fire-clay coal workings, where these measures are got out by a single operation, extracting the whole thickness of the seam at once, whilst only 13 deaths are attributable to similar accidents in thin coal mines. This clearly shows the greater safety to life and limb attending the long-wall system of working, which has been practised in this district in thin coal mining for at least a century. When it is added that where the thick coal is won by separate and distinct workings only three lives were lost from falls during the year, the argument in favour of such a mode, as most compatible with the safety of the workmen, hardly needs any further support. This improved plan of getting the thick coal was introduced some 30 years ago at the Shutend Collieries, belonging to the late Mr. James Foster, of Stourton Castle, on the suggestion of the late Mr. George Jones, of Shackerley Hall, who subsequently became a very extensive iron and coalmaster in the district. The system has since and is still very successfully carried on at the above-named and other collieries in the district. It is to be regretted that this admirable plan of working the thick seams of South Staffordshire and Worcestershire has not hitherto more generally superseded the old mode, which, year by year, contributes under the head of falls so large a proportion of the deaths from mining accidents in this district. He is of opinion that the accidents in these mines, when worked according to the old plan, would in many cases be reduced by opening a smaller extent of operation at one time, which would permit of the work in each of the openings being pushed on faster, and thus render the working places less liable to falls. In some instances, in thick coal mines, the openings have been narrowed in comparison with what they were formerly, and still further limitations would have a tendency to diminish accidents from falls, especially in friable and tender seams, some of which are much contorted and cut up by "slips" and structural divisions, thereby increasing the danger in the working of seams so lofty as to render support by timber impracticable. Mr. Baker remarks that a mass of coal or roof frequently falls without any perceptible indication on the surface of the coal previously, and when, in the judgment of all engaged, sufficient timber had been used. In order to guard against these accidents, the managers of coal mines should insist on a more extensive and abundant use of timber, and it is desirable that it should be set, where practicable, in a more uniform manner; and it is always better to entrust the timbering to one or more competent men than to leave it to the discretion of the ordinary workmen. The evidence given at inquests when death has occurred from falls is almost invariably to the effect that the place was examined a short time before the accident, and was then pronounced quite safe; and there are always some of the men who were working at or near the spot when the accident happened, and not unfrequently some of those who were hurt by it, ready to support these statements. With a view to prevent such accidents, it appears desirable generally to enfore such an order as was given recently by a colliery manager, who, in his presence, during the examination of a pit after an accident of this nature, directed that timber should be set up at intervals of so many feet, whether it appeared to be wanted or not. He regrets to say that in this, as in other classes of accidents, the carelessness of the workmen, and their disobedience to the regulations of the mine and to the special rules, occasion many of the deaths which occur. Alluding to shaft accidents, Mr. Baker states that eight persons lost their lives by falling out of the skip as they were ascending or descending shafts. In most of these cases there was no reason why the sufferers should have fallen had they been in full possession of their faculties, or had they not from lapse of ordinary caution loosed their hold. Very recently he was ascending a shaft in a skip with several other persons, when he discovered, to his surprise, that one of the number had no hold whatever of the band-chain tackle, and appeared to regard such a precaution as almost unnecessary. It often happens that the miner working by "stint," in order to make up for loss of time, or for some special reason, tasks his strength unduly to accomplish an excessive quantity of work, and faintness or giddiness arising from exhaustion thus produced doubtless occasions some of these accidents. With a view to guard against such fatalities, he has advised the use of a safety-chain, which he always adopts himself, and which, being passed round each man or boy's body, and the opposite end linked to the chain or band, is an effectual protection in such cases. This simple and inexpensive means of preventing loss of life is being gradually adopted, and will, he trusts, probably come into general use, especially where loose skips are employed. He hopes for the general provision of guides and cages in his district. Referring to explosions, he condemns reliance upon natural ventilation alone; and with respect to the ignition of a blower, he observes that with a view, however, to prevent the recurrence of such an accident, locked safety-lamps were, at his request, directed to be exclusively used in that part of the workings, and they were at once procured. After the lapse of some time, however, the men refused to work with the safety-lamps, and two of them were summoned for leaving their work without due notice, which charge was dismissed, on the ground that no contract existed requiring notice to be given. Mr. Wm. Mathews, one of the justices, told the men they should have taken the advice of the ground bailiff, as it was to secure their safety that lamps were used instead of candles. When the Coal Mines Inspection Bill was before Parliament many complaints were made by the men that they were obliged to work with candles, and when lamps were provided they were the first to rebel against the law. The accidents under the head of miscellaneous were attended with the loss of 16 lives, or six more than in the previous year. A large portion of the ironstone measures in South Staffordshire and Worcestershire have been partially exhausted; and owing to this cause and to the great depression of trade during the year, the operations in these mines are more limited than formerly. There were 20 separate accidents in these mines during the year, resulting in 21 deaths. The general remarks made in reference to the coal mines apply equally to ironstone mines, excepting those made with reference to the tenyard and other thick coal measures. Both the deaths from explosions were the result of disobedience. Of the eight deaths from falls, three arose from slips; three from neglect of spragging, &c., whilst holing, which is a breach of special rule 28; and the two others were of a purely accidental character, the places where they occurred having been well timbered. The effect of the educational clauses has been to cause the dismissal of boys under 12, the managers not caring for the trouble of getting certificates.

Mr. BROUGH (Western division) reports that in the iron-making counties, where thick beds of coal and rich bands of ironstone are grouped close together, it will require more stringent arrangements than any expressed in the present Act to diminish the lamentable awful loss of life that ensues year after year, by falls of ponderous masses of matter from roof and sides, especially in districts like Monmouthshire and South Wales, where the stratification is so abundantly (indeed, almost mathematically) reticulated with slips, joints, and other forms of structural division. Each succeeding year also the levels and headings extending further from home, and as the collieries and mine works get older and more squeezed, they certainly do not improve in security to human life and limb. As it is required that the annual report should embody some observations on the state of education in each district, so far as it relates to boys who are occupied in mining pursuits, he may say that it is too early as yet to form any opinion as to how the second section of the Act of Parliament influences the great desideratum. One thing, however, is certain, so far as adults are concerned—the number that can neither read nor write is afflicting beyond measure. Some recent inquests have demonstrated in a lamentable manner that which he has long been well aware of—viz., the deplorable amount of ignorance too often found in those who are actually entrusted with the practical management underground, many of whom, indeed, do not know a letter of the alphabet. He speaks of the class termed on the south of the Bristol Channel bailiffs, on the other side overmen and firemen. If this dark ignorance exists amongst the officers of collieries, it may well be found in the poor working men themselves. He is glad to record that in Monmouthshire and Glamorganshire the long wall method of getting coal is creeping in, though still but slowly. It is not only an improvement as regards the safety of the people, but by its adoption all the coal or ironstone can be extracted from the ground. In the old times the quantity buried was a loss, not only to the owner of the soil, but it also was a sacrifice of valuable national property. We ought not to lose or waste the property of future generations. We are but the trustees of those who have to come after us, and though the more coal we now produce the more we promote the immediate movement of the country, and increase its present industry, we still have no right, nor can find any justification, in wasting that wealth which partially belongs to posterity. Long work will, as a rule, prevent much of this loss, at the same time that it will add to present profit and prosperity. However, its application will require consideration, and the workmen will have to be gradually introduced to all its peculiarities. He regrets to say that during the last year and a half more wire ropes broke in his district than had previously come to his knowledge or under his observation. If the quality of the wire is kept up he will not entertain anxiety as to this class of band; but on that very point of quality alone rests the whole question, on that all safety depends.

Mr. EVANS's (South Wales district) report is chiefly of a technical character. In his district the winding arrangements at many of the smaller collieries are still very much behind the age, more especially in Pembrokeshire, and the landsale collieries in Carmarthenshire. Although there has not been any loss of life from the breakage of ropes, several have broken, and done considerable damage to property, and, of course, might have been attended with serious consequences. At Lletty Shenkin Colliery a wire rope broke in the winding shaft; fortunately, no one was injured, the damage done was considerable, and some days elapsed before the colliery could again work; the men were brought out through an adjoining mine, belonging to the same company. This was almost a new rope, and had worked but a very short time. The cause of breakage was not at all satisfactorily explained by the company who supplied it to the owner of the colliery, and Mr. Evans is induced to believe that the quality of the iron was not such as should have been used for winding purposes. At the Great Western Railway Company's colliery a rope broke, but this was through a defective mode of fastening it to the drum. At the Neath Abbey Company's main colliery a rope broke whilst a man was on the carriage; he was severely injured. In this case the rope, in his opinion, had been too long in use, and was considerably worn. The winding shaft was then used as an upcast. In his last report he pointed out the condition of this colliery: it was ventilated through a very small downcast shaft, the shaft through which persons passed was the upcast, and the winding machinery was defective. It gave him much pleasure to be able to report that a new shaft had been sunk for ventilating purposes, and a most excellent winding engine erected, creditable to the owners and manager. In many of his reports he has urged the necessity of doing away with the use of so dangerous a means of lowering and raising persons in water balance machines as single-linked chains. In consequence of an accident to a collier underground at Cyfarthfa, Mr. Evans had his attention directed to the general use of these chains at Mr. Wm. Crawshay's collieries, although he had by letter to the agent, as well as personally, objected to them as being in direct violation of the general rules. He instituted proceedings against Mr. Robert Crawshay, and the magistrates imposed a penalty. It is, however, due to the owners of this extensive establishment to state that within a very short space of time after this, much sooner than he hoped for, they fitted up all their shafts with good chains of three links, and renewed much of the machinery. This was a matter of very considerable expense, and required time, for there are eight or nine of these shafts at work. He thinks now in South Wales there is no instance of a single-linked chain employed for winding persons.

Mr. WILLIAMS's (East Scotland district) report, having been prepared after his death, is of a purely technical character, and contains no recommendations or suggestions.

Mr. ALEXANDER (West Scotland district), after tabulating the casualties in his district, and showing 36 accidents, resulting in 37 deaths, in coal mines (=6·0 per million tons raised), and 12 accidents, resulting in 13 deaths (=7·6 per million tons raised), in ironstone mines, observes that though the seams of coal and ironstone are worked under similar conditions, in making a comparison, it would be fallacious to state that the risks in working ironstone mines are more than in working coal mines, because a greater number of lives are lost per 1,000,000 tons raised. Ironstone is more difficult to work, independent of the large proportion of rubbish which requires to be taken out, in some cases greatly exceeding the weight of the ironstone, whereas in working coal seams there is generally sufficient space at a convenient distance underground for stowing purposes, and very little rubbish requires to be drawn to the surface. The statistics of ironstone mines are yet incomplete, but further experience will probably prove that coal mining is a more hazardous occupation than ironstone mining in proportion to the number employed and the work performed. For the past year the loss of life from the destructive effects of fire-damp has been considerably reduced; so far this is satisfactory, but a reference to the details of these accidents must convince all of the necessity there is for more stringent and effective measures being observed by those who take upon themselves the responsibility of carrying out the details of underground management. It frequently happens that the workmen themselves contribute by their recklessness to produce these unfortunate occurrences; but for the past year he does not think that in any case they could be charged with inattention or neglect for the accidents which occurred of this description. The preventive measures are well known, and in one form or other there is no copy of general and special rules but which contains them. No collier should be allowed to enter a pit in the morning till after a strict examination has been made of all the working parts; and if foul air is found to exist in any working places, the workmen should be prevented from entering them till the fire-damp is displaced, and the ventilation restored; and until these simple but necessary precautions are thoroughly enforced at all underground works, partial explosions will continue to take place, occasioned by slight accumulations of gas in isolated corners, and resulting in serious personal injury or loss of life, just in proportion to the extent of the accumulation and the nature of it. The accidents from falls of coal and roof seem nearly stationary, and, excluding fractions, are exactly the average of the last six years. Two-thirds happened to the workmen while engaged taking down the coal in their working places. He is convinced that management cannot of itself prevent these accidents; much, however, can be done in the way of directing attention to the peculiarities of the mine, and insisting upon proper precautions being practised; for example, such as when working a seam of coal in two divisions, and when the under one is worked in advance, he thinks it is questionable whether it should be left to the workmen to consider whether the upper division requires support or not, but that they should be made to understand, whenever they require to work under the upper division or roof coal, that wooden supports are indispensable; they are easily set up, they would prevent nine-tenths of such accidents, and, comparatively speaking, it involves no labour in taking them down, in cases where that would be a matter of economy. In long-wall work, and where the action of the overlying roof is always tending to force down the seam, as soon as a given distance is undermined the workmen should be taught to leave natural sprags, or introduce gibs, to secure the coal till the length of holing is completed, and the seam is ready to be taken down. For the past year shaft accidents have been diminished to a considerable extent; they do not exceed two-thirds of the average of former years, and with, perhaps, two exceptions they may be termed pure casualties. No shaft is complete unless fitted up with properly constructed guides and covered cages; with such arrangements, and a well appointed-bottomer to see the shaft regulations fairly carried out, I am of opinion that accidents in shafts may be still further reduced. The casualties from miscellaneous causes and on the surface have been of the usual description, with this exception, that one of them was occasioned by the bursting of a boiler, the first accident of the knd that has taken place in this district for the last six years. Owing to the short time that the provisions of the Act have been in operation relating to boys between ten and twelve years of age, he does not feel yet prepared to give any definite opinion regarding the real working of it. He has not observed in many cases that much inducement is given to boys to attend school two days in the week, and to work the other four; such an arrangement, however, is by no means impracticable, but from all he can learn it is not popular. Practically speaking, boys engaged as trappers cannot, unless the managers take some trouble in making the necessary arrangements, attend school two days in the week, and it is doubtful if parents, particularly those who have not been educated themselves, make all the exertions they might make to enable their children to obtain even this limited education. Employers and general managers seem to have no desire to admit boys into the mines contrary to the terms of the Mine Inspection Act; indeed, he cannot see that under any circumstances they have an interest in doing so, and the feeling with employers is that every boy should be able to read and write before they are sent to work at all. In isolated cases it may prove a little hard on a family where a boy is turned out of the pit. Such was the case since he had occasion to direct attention to one being employed in a mine under the proper age, who could neither read nor write; and on going into the matter, it turned out that the father of the boy had been confined through sickness for a number of weeks, and that the little boy was the only direct support the family had to depend on from the father's illness. Of course, such cases may be expected, but, on the whole, the limited education which the statute in part provides for—of being able to read and write—will be a great boon to the rising generation; and were it not that the influx to mines, from Ireland, of young fellows from 16 to 20 years of age, many of them uneducated, is so great, the population of the mining districts would soon become generally as intelligent and educated as those employed about any other branch of industry where boys can be usefully employed at an early age. Mr. Alexander considers that the standard of being able to read and write seems nearly as much as ought to be enforced, and to those who in after life may wish to advance themselves such an education would place them on the way of self-improvement; it will enable them to take advantage of night school instruction, or to listen with some degree of profit to popular lectures; and now that cheap and excellent books are within reach of every working man, it may be expected that with increased education knowledge will be more generally diffused among the mining population, and that by it new sources of enjoyment will be opened up, enabling them to pass their lonely hours more cheerfully, and their social hours more agreeably and instructive.

IMPROVED TURBINE WATER-WHEELS.

We have upon several previous occasions alluded to the turbine as the most efficient form of water-wheel that can be adopted, and we now take the opportunity of directing attention to one of the best form of turbine that has been produced. At the International Exhibition, in the western annexe, near the great engine of the Lilleshall Company, will be found a series of turbine water-wheels, manufactured by the NORTH MOOR FOUNDRY COMPANY, under the patent of Mr. Schiele, whose form of turbine has already been largely adopted. Of the subjoined diagrams, Fig. 1 is an elevation of a turbine with a vertical shaft, with the casing around the wheel in section, and Fig. 2 is a plan of the same corresponding to Fig. 1, showing the casing around the wheel in horizontal section:—

Fig. 1.

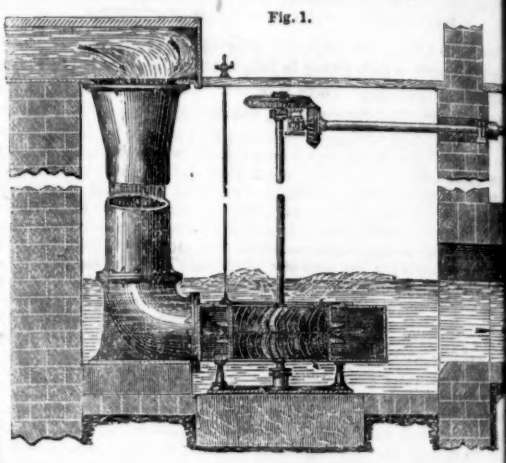
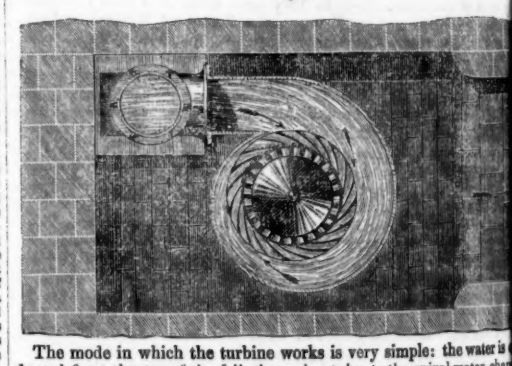


Fig. 2.



The mode in which the turbine works is very simple: the water is conducted from the top of the fall, through a tube, to the spiral water-chamber which surrounds the drum; from this chamber it passes through the wheel ports on to the centre of the outer side or periphery of the drum, in such a direction as to enter the curved buckets or wings of the wheel without any shock. It will thus be understood that the water passing down the supply tube cannot escape without passing through the curved buckets, and that in making this passage a forward rotary motion must be given to the drum, such motion being readily communicated by the gearing to any machinery which it may be desired to drive. The power is driven by a steady pressure of the water while it is passing along the curved wings, and having exhausted all its power, passes out from each end of the drum into the tail race. The wheel being water-tight, and full of air only, is partly floated by the water; the supply can also be introduced in greater quantities to the upper wings than to the lower; the position of the drum axle upon the foot-step can thus be regulated to reduce friction to the minimum. The drum is readily accessible, and can be lifted out without removing any other parts in order to get at the foot-step, and the quantity of water admitted (and consequently the power of the wheel) can be regulated with great facility by the closing or opening of additional water ports. It is found in practice that the turbine can be made to work with a speed as uniform as that of a steam-engine, and when they govern themselves to the extent needed for most practical purposes; for perfect correct speeds, or where the load is extremely variable, the application of Schiele's hydraulic governor enables the manufacturers to guarantee a more uniform speed than can be got from the best steam-engine. It is justly remarked that, perhaps, the best test of the value of the turbine over the ordinary water-wheel is in the fact that in countries where water-power is of most value, on account of the scarcity or high price of fuel rendering steam-power very expensive as a motive power, the turbine has almost entirely superseded the use of the ordinary water-wheel. When it is compared with the ordinary wheel, the turbine is very small, and requires scarcely any foundation or other preparation, whilst its speed is so much higher that its power can be transmitted at once, thereby dispensing with expensive intermediate gearing for giving at the same time an increase of effective power. A turbine can also, in many cases, be applied where a water-wheel could not, on account of limited space, or falls, where a series of common water-wheels would be required. Another important feature of the turbine is that its motion is much more constant and uniform than that of a common wheel, in consequence of the equal diffusion of the water over the whole its circumference at the same instant; but in a common wheel there is always an irregularity of speed and back-lash. The turbine will also work under back-water to any depth, and will only suffer so much diminution of power as is just proportional to the decrease of fall, so that on tidal rivers the advantage derivable from its use is very considerable. Prof. Beardmore has found, by careful experiment, that the best undershot wheel utilises but 33 per cent., and the best breast wheel but 52 per cent. of the power contained in the water, whilst the turbine utilises very nearly the whole; the results of Messrs. Fothergill, Wrigley, and Smith upon Schiele's turbine, on a fall of 6 ft. 1 in., showing the effective power given out to be 89 per cent. of that obtained by calculation with the formula discovered by Blackwell (for which he received the Institute of Civil Engineers' premium), and which has since that time been adopted by the best authorities. The principal recommendation of Schiele's turbine, therefore, is that it combines the simplicity of the most simple wheel with the maximum power of the water-wheel. The International Jurors have awarded the North Moor Foundry Company a Prize Medal for the originality of design and practical success of the turbine fans, &c., but their decisions have been made so entirely regardless of the merits of the cies exhibited that it will probably be to the general public a more convincing proof the value of the machine to state that testimonials of a very flattering character have been received from a large number of well-known manufacturers and others who tested its capabilities by continued practical use. The fan to which we have incidentally alluded above is that known as Piatt and Schiele's Silent Fan, which applied to blast purposes has proved one of the best blowing machines extant.

The North Moor Foundry Company also manufacture an open fan on Schiele and Williams's Marine Ventilator—upon a principle somewhat similar to the silent fan already referred to. The Marine Ventilator is driven direct by a patent steam turbine-engine, without the intervention of any strapping or gearing whatever; it has been in use for some time, and has given great satisfaction. In all the vessels of the City of Dublin Steam Packet Company the machines have been in use for about five years, and they have also been applied by Messrs. John Laird, Sons, and Co., Birkenhead; T. B. Winter, London (for the India Government vessels); James Watt and Co., London (for the Indian Government troop ships *Indus*); Douglas Hebson, Liverpool; the Pacific Steam Navigation Company; R. S. Newall and MacIver, Liverpool; Westwood, Baillie, Campbell and Co., London; Randolph, and Co. (for the vessels used in laying the Red Sea telegraphic cable; Randolph, Elder, and Co., Glasgow; the Government of Holland; the Peninsular and Oriental Steam Ship Company; the Société Nouvelle pool, New York, and Philadelphia Steam Ship Company; the Drogheda Steam Ship Company; Forges et Chantiers de la Mediterranee, Marseilles; the Waterford Steam Ship Company; the Egyptian Government; Messrs. Bibby and Co., Liverpool; the Waterford Steam Shipping Company; Harland and Wolff, of Belfast, and many others.

ARTIFICIAL FUEL.—Mr. F. C. Warlich, of New Cross, proposes to employ the waste gas resulting from the distillation of coal to heat small coal sufficiently to consolidate it, and for the collection of the tar and ammoniacal liquor.

DOUBLE SHAFTS AND ADITS FOR SAFETY IN THE WORKING OF MINES, COLLIERIES, &c.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—The imperative necessity of adopting something positive and practical *for prevention of future accidents in mine, coal workings*, &c., is apparent to every man of feeling and common sense, and it behoves Government and proprietors of mines, &c., to enforce and secure the proper remedies and prevention of such "*avoidable accidents*" as the Lund Hill explosion, and others of a similar character, which have not only taken away hundreds of industrious men, but have pauperised their families, and caused dismay on all sides. The removal of destructive odours and gases from the goaves and workings might be easily effected by flexible india-rubber or gutta percha tubes, being led through and suspended from the arched ceilings or roofs of the workings, having funnelled metal mouths or inlets to the tubes for the foul air, &c., which, having passed *horizontally* through the flexible tube conductors, could then be run into the *vertical* air-channels, shafts, or passages, leading upwards and onwards to the furnace or chimney of the surface steam-engine, delineated by the accompanying diagram, at E, E, E.

The diagram also shows my patented mode of sinking *dovetailed stone* shafts for wallings of mine and pit shaftings, combined with cast-iron concave base or ring curbs, which secures the walls from *expansion* or *contraction*, being all locked together as vertebræ; the materials being indestructible, by employing in combination Hutchison's patent indurated cements, or Ransome's patent process, and by which inventions sands, chalks, gravels, or Ransome's patent process, and by which inventions sands, chalks, gravels, or shingles, on the spot, may be converted and made at once into *economical and everlasting masonry shafts*. The centre portion of the shaft at F, in plan, would be kept open and available for the supply of fresh air, and for working the lift apparatus up and down. A ring *iron plate* at the top of rims, near the surface, would prevent any escape of foul air, other than to its intended course—(the exhausting furnace of the steam-engine chimney at surface). By using *double* doors, with close web wire or lattice perforated panels in the frames, the passage ways in the mines would be kept perfectly healthy and secure.

The use of candles, lucifer matches, or pipes of tobacco, should be determinedly prevented, by inflicting a heavy fine or imprisonment; and one conviction should prevent the offender from obtaining future employment in such mine or pit, Lock the Davy lamps, number them, and carefully deliver their daily supply to the miners, by an authorised clerk or inspector, at the pit's mouth. With these remedies applied, the pits and mines would be as safe as other tunnel workings, and explosions, collapses, and other similar accidents, would be totally prevented. I trust something will be done, and set about in real earnest, for the future welfare and benefit of all concerned.

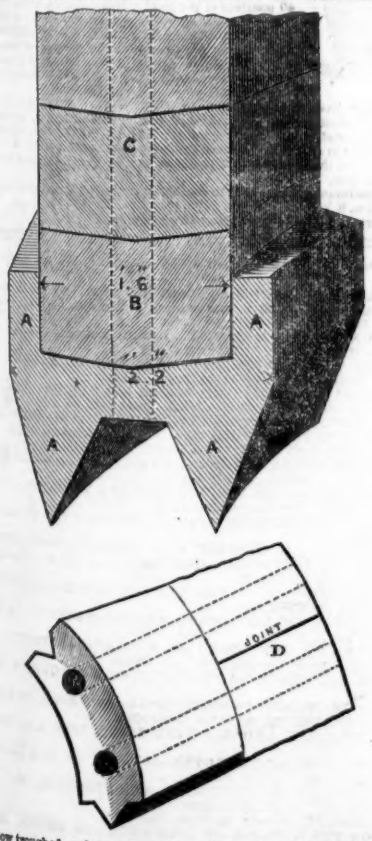
W. AUSTIN, C.E.

Milford, South Wales, Sept. 17.

PLAN OF PIT SHAFT, OR SECTION OF ADIT OR TUNNEL.



PERSPECTIVE OF BLOCKS AND RING FOOTINGS AT INCREASED SCALE.



A, A—Show troughed and fanged cast-iron footings in *continuous ring curbs*, into which the first or *lowest course* of dovetailed blocks are dropped two-thirds of their depth of courses.

B, C—Show progressive or alternating blocks of indurated dovetailed masonry walls, breaking in their beds towards the centre of wall rims, which latter are pierced with dotted holes, E, E, in the plan, and breaking joint or bond at D in perspective section.

F—Shows the plan of shaft or pit centre, which affords safety in construction and in after workings. In excavating or sinking down the shafts, the curbs are underset, and the rubbish lifted, or the water pumped up to the surface. *No collapse can occur*, and the lifting table or gear would never be subjected to undue pressure.

N.B.—The blocks can be worked *horisontally* as well as *vertically* for tunnels, sewers, drains, aqueducts, &c.

"A SAFE ON SAFE TERMS."—The attention of our readers is requested to an advertisement which appears in our Journal to-day, headed "Extraordinary Bargain," wherein it will be seen that a Provincial Insurance Company having lately been merged in a London office, and having no further use for the safes and deed chests lying at the various branch offices, they have been returned to the manufacturers, to be sold for half their cost; but the most important feature is, that parties at a distance are requested not to remit the money until the safe is received, when, if not found in all respects satisfactory, it may be returned without any cost whatever to the person ordering them, as they are sent carriage free to any station It may prove worth the attention of those requiring one of these useful articles.

THE GEOLOGISTS' ASSOCIATION.

VISIT TO THE INTERNATIONAL EXHIBITION.

On Tuesday last the Committee of the Geologists' Association met the members and their friends at the International Exhibition, with a view to the examination of some of the more interesting geological and mineralogical specimens from North Wales, New Brunswick, the Ionian Islands, Brazil, Russia, Sweden and Norway, Austria and the Zollverein.

The proceedings commenced by Mr. J. H. CLEMENT describing the specimens of gold and gold ores exhibited by the Vigra and Clogau Company and by Mr. Readwin. He said:—I beg to call your attention particularly to Mr. Readwin's case, as such an occasion may not soon re-occur after the closing of this Exhibition, as the gold specimens have been collected, I am perfectly satisfied, after much solicitude, by Mr. Thomas A. Readwin, who had resided in the district of Dolgelly, Merionethshire, for some considerable time, and had endeavoured to establish mines and reduction-works in the district, but at that time (1853) failed so to do, equally with Mr. George Bruin, under Mr. Arthur Dean, in 1844, and in 1846 under my own superintendence, as will be shown in subsequent lectures, from want of funds. The great merit of this case is, that taken in a geological point of view, it proves the Lower Silurian formation on the north side of the River Mawddach contains quartz lodes, which, besides other minerals, contains gold in appreciable quantities, and not alone in one measured spot, as the case exhibited by the Vigra and Clogau Company represents but that the precious metal is to be found in a length of some 18 miles, and from all I was able to prove during a residence of a year and a half, by constant assaying by fire, and analysing by chemical means, I proved these same facts without the visible signs now so ably displayed to you. It was several months before I saw visible gold, in 1845 and 1846. I now present to your view the first stone obtained with visible gold in it which was found in that country: it is from the mine of Cwmheisian, thrown out by some miners; the taker of the bargain to excavate the level in the mine by name was William Owen; this was in 1845. The question of who was the first party in latter years (for the ancient Welsh, it is well known, had much gold in their possession long before Julius Cæsar arrived in England, and it was probably known through the traders for tin to Cornwall, whom history assigns were Phœnicians) to find gold in the lodes in the hills north of Dolgelly, seems to be a disputed question; but I can say that Mr. James Harvey, a gentleman who had obtained possession of numerous grants of mineral leases from the Crown and the landlords of the district of Dolgelly, about 1841, had become possessed of the fact through Capt. Robert M. Roberts, a mining captain of Dolgelly, who introduced to Mr. Harvey's notice all the best lodes of the district. Mr. Harvey had the ores from them assayed, and found that there was gold in some of them, which Captain Roberts claims to have known since 1838. The assaying of the ores under Mr. Harvey began in 1842, but nothing satisfactory came of these assays which proved the existence of gold, until some considerable quantities of gold was found by fire assays of ores and stones from the Cwmheisian Mine, near the Falls of Rhaider Mawddach and Piayll Cain; after which Mr. Arthur Dean, civil and mining engineer, whom Mr. Harvey employed to sell the mine for him, put all the facts then known up to the time together of the existence of gold, and read a paper thereon before the British Association in 1844, and attempted to show that a regular system of gold veins existed in the Snowdonian district, as he called the Dolgelly district. From some reports and statements I have in my possession, dated April and May, 1843, by Mr. Arthur Dean, he makes no mention of gold, but merely takes credit for lead ore, with 70 per cent. of lead and 45 ozs. of silver per ton—value 22*l*. 10s. per ton. It was after 1843 he appears to have become possessed of the fact, apparently from fire assays made for or at Mr. Harvey's expense, that gold did exist in the lodes at East Cwmheisian. In 1845 Mr. James Harvey consulted me at his office in Old Broad-street, London, as to the fact of gold being present in some parcels of ores he then showed me. This led, as I could not see gold in those ores exhibited to me in his office, to my going down to Dolgelly, and personally visiting his mines and those he had sold to a Mr. Bruin for 15,000*l*. I inspected, with Mr. James Harvey, all the mines and places where lodes cropped out to the surface, from a place two miles west of Vigra Copper Mine, known as Caegwian Bulchcoch; Vigra (a deep, and flooded at the time) Copper Mine; Clogau Copper Mine; and all the lodes visible north and south of Clogau Copper Mine, which included a hole on the top of the hill, under which is now worked the St. David's gold lode, belonging to the Vigra and Clogau Copper Mining Company, in Clogau Mountain, making our exit out of the mountain near Borthonog, at the same date pointing out where an adit should commence from. All the spots visited I considered on that day good for copper, so far as concerned Vigra and Clogau, but all surface holes I could not decide upon their value until the samples taken should be assayed; I could say nothing more than that they were places with good indications of mineral wealth for copper, any gold in them would follow the copper in the dressing, and subsequently be found. I then visited Tyddyngruiadus, a silver-lead mine, and declared it at once a good lead mine; that as to silver or gold, it must be decided by fire assay. We then visited Cwmheisian West Mine, which appeared, from all I heard of its produce, to have been a good lead mine, but abandoned in 1844, for the sake of the East Cwmheisian Gold Mine. Here, again, I could find no visible gold in the ores or stones of the mine stuff, but succeeded in finding a show of gold dust in some wastes from an endless buddle, the invention of Messrs. Brunton—parties who had erected other machines at this mine to separate gold by means of its specific gravity, after fine grinding, all of which failed. I was subsequently appointed by Mr. Bruin to systematise the operations, consequently all future operations at the Cwmheisian Mines, and all others purchased of Mr. Harvey, came under my control in 1845.

I set to work the Cwmheisian Mine proper, Caegwernog and Berthlwydd, and took care to regularly assay the ores personally that were extracted, and found at Cwmheisian the ores contained over 1 oz. per ton. The same with those at the Berthlwydd. The lode at Caegwernog became so small that that mine was stopped, and subsequently all the other mines from want of funds on Mr. Bruin's part. It was intended to form a company, consequently I worked with all care to show that gold existed in sufficient quantities to repay any capital required to place them in a dividend state, which I stated to be about 35,000*l*.; to this amount 25,000*l*. more was added, in order to repay Mr. Bruin all outlay to date, and cover the expenses of getting up the company. The above sum of 35,000*l*., it must be remembered, was required to place all the mines belonging to Mr. Bruin in a proper state to produce 102,000*l*. worth of gold, silver, and lead per annum, and I believe at this date that it can still be done for the same money—viz., 35,000*l*. The time it would take to bring the mines to this state I fully believe would be only the usual in such case—viz., 7 to 10 years. It must be remembered there were nine mines. After it was resolved to form a public company, I placed in Mr. Arthur Dean's hands, in the presence of Mr. Edward Baldwin, a quarter of a hundredweight of picked specimens, which were all that I had reserved from the Cwmheisian Mine; several had been given to visitors and friends. Neither Mr. Harvey, Mr. Bruin, Mr. E. Edward Baldwin, the purser to the mines of Mr. Bruin, or any connection of Mr. Harvey's, or any Welshman, had ever seen visible gold till 1846, when it was discovered in the Albert and Victoria level of Cwmheisian Mine, when under my administration.—[These parties would all have shown them to Mr. Clement had they had the opportunity by having specimens in their possession.] Had there been any, everybody would have been too glad to have sported them, and it would have gone far to stop the bad favour in which Messrs. Harvey and Dean were held in by the Dolgelly people, and others I could name, for having sold the mines to Mr. Bruin for 15,000*l*., cash on delivery, and no gold to be seen. Time, however, has not fully developed the gold question; subsequent trials and failures under Mr. Readwin's administration failed to prove whether or not Cwmheisian Mine could be worked profitably as a gold mine, and it remains still a mute question. Other mines, such as the Dolfrwnog, south of Cwmheisian, but in the same mountain, have had the same unsettled fate, but it is to be hoped that at this date (1862) it will be better understood how to manipulate a gold mine, although what I have seen during the last few weeks while on the spot fails to satisfy me that it will at last be proved. I cannot say I admire any of the present plans of working the mines of the Dolgelly district, or the method used for extracting the gold. As I have already said, the Lower Silurian formation when containing quartz lodes with mineral substances in them are now proved to have gold in them for a distance of some 18 miles in length by 2½ to 3 miles in width, in which I expect there are six parallel lodes, all of which contain gold; it must not be understood that I mean to say that all along every lode there will be gold in paying quantities, or in any degree equalling the present or past produce of the St. David's lode in the Vigra and Clogau mining sett, but that there will be the same chance of finding points quite as rich, I have no doubt, and I believe, that such points will be indicated by the quantities of certain mineral substances in the lodes and encasing rocks, which I consider to be nickel, black oxide of iron, and magnesia. In some cases sulphide of lead will be found rich in gold, as at Moel Yspry, where I discovered it first in 1846, in combination with silver. All, or nearly all, the copper ore of the district, when found in lodes running through the Lower Silurian formation, contains gold. In the Cambrian sandstone there are some strong lodes, which are parallel to the gold lodes; but in them hitherto I have never found gold, but I am free to confess that Messrs. Johnson and Matthey, of Hatton-garden, have found as much as 12 grs. per ton, which has caused me some surprise. Subsequent assays have not, I understand, given more than a trace; this proves that gold is somehow or other there, and I consider there must be a cause for only a small quantity being present. I suspect that Messrs. Johnson and Matthey's assay was from a lode very much in a portion of both formations, or a portion of the Lower Silurian formation may have become enveloped in the Cambrian sandstone during some convulsion of these Dolgelly hills. There are several eruptive rocks in the Lower Silurian formation; some are siliceous greenstones, some are felspathic, some are magnetic. Such, if they are near any lode, have, no doubt, added their influence in the deposits of gold (as an instance of such power, view the depositing of gold, silver, or copper in the western annexe by magnetic influence) in the lodes near them, as well as causing large deposits of bisulphide of copper and other sulphides, such as iron and zinc; also galena, which is a sulphide of lead. Such galena as is in the east and west lodes of the Dolgelly district, that hold gold, is accompanied by antimony, as may be observed at Moel Yspri. Further east, at West Cwmheisian, where the lodes are found running through, or near, basaltic formation, in the Lower Silurian formation, the sulphide of lead is purer, and only contains sulphur, silver, and gold. In this mine there is a sulphide of iron band averaging 3 to 6 in. wide, which contains metallic gold, which becomes visible on dissolving out the sulphur by acid. By roasting such ore the gold does not in every case become visible after roasting or washing, which is a curious fact, but one which can be chemically explained. In conclusion, I can only say I am happy to have had this opportunity of pointing out to you the known facts of the discovery of gold, its site and the formation, that seems all over the world to be favourable to its production; and although, if looked on as a picture, the Dolgelly gold field may have a rather different appearance than other countries, I maintain that they are all rocks of the same era, and are chemically composed of the same substances, and developed under the same influences, but in other countries are more gigantic in form, and more extensive in regard to territory, which may be claimed to be of the Lower Silurian period. Case No. 383 proves nothing in a geological point of view, and, from all known facts, extends neither east or west of the few yards it has been found in, thus causing great anxiety to the proprietors of the mine. But still there remains the fact that every vein, be it ever so small, being parallel to the great deposit, has gold in it to a small amount. If mining operations are carried on with proper energy in any portion of the, more or less, 60 square miles of this district, with the full knowledge that mines require money to a considerable extent for their development, and several years allowed as time of development, I look for a great future for the gold field of Dolgelly, which extends from Barmouth to Cwmheisian in a west and east direction, and turning northward to Trawsfynnydd, where I expect the Lower Silurian formation has greater extension, and the quartz lodes more numerous. Still, great attention must be paid to the analysis of the content of the lodes and encasing rocks. On a future occasion I hope to bring the mining for, and metallurgy of, gold before you.

The Rev. D. HONEYMAN remarked that it was often considered in England that the whole of the North American provinces formed but one district, but that in North America this was not the case, the upper and the lower provinces being regarded there as distinct; New Brunswick, Nova Scotia, Prince Edward's Island, and Newfoundland forming the lower provinces, and the Canadas the upper provinces. The forests were one of the chief resources of all of them; and with regard to the colony in whose court they now were, he could tell them that they had pines, cedars, and other trees, which would have enabled a timber trophy to have been formed which would have rivalled the neighbouring provinces; and he trusted that at another International Exhibition, in 1872, the lower provinces would make a far better show. They would see around them some very handsome native costumes, although the aborigines were fast disappearing, both in New Brunswick, Prince Edward's Island, and Nova Scotia. The great natural resources were the quarries; and the St. John's River, which was navigable for a great extent, offered many facilities for transport. The geology of New Brunswick was much the same as that of Newfoundland. They had the Lower Silurian, which was, probably, auriferous in New Brunswick as well as in Nova Scotia, the middle Silurian, the mountain limestone, and the carboniferous or coal formation. These formations bore much the same characteristics as the corresponding formations in this country; they had the same trilobite in the mountain limestone, for example, and so on. With regard to building stones, they had granite, syenite, and gypsum, or plaster of Paris. He might here observe that in England this latter material was of tertiary formation, whilst in Nova Scotia and New Brunswick it occurred in the lower carboniferous. Many errors had crept in amongst the earlier geologists in consequence of this, and he believed they were first set right by Sir Charles Lyell. They had hematite iron ores of great value in the province; but, perhaps, the most interesting mineral was the Albert coal, or Albertite, a specimen of which he would pass round for their inspection—it was so called from being found in the county of Albert. Some supposed Albertite to be of Devonian age; some, and amongst these Dr. Percy, Mr. Hay, and Dr. Jackson, consider it to be true coal; whilst Dr. Taylor, the author of "Statistics of Coal," regards it as an asphalt. It was first discovered by Dr. Abraham Gesner, who considered it to be an excellent material for the manufacture of gas (upon analysis, Albertite gives—Carbon, 85·90; hydrogen, 9·00; nitrogen, 2·97; sulphur, a trace; oxygen, 2·03; ash, 0·10=100·00); but as the gas company had a monopoly for making gas from coal, a lawsuit was the result, it being disputed whether it was or was not coal. The fact was, that in composition it approaches very nearly to the jet of Whitby. From this Albertite they extracted an oil which was called Albertine, and which had all the properties of paraffine oil.

The company then proceeded to the Ionian Islands department, where Prof. TENNANT described the various specimens exhibited, and explained the geological formation of the islands. Alluding to some specimens of breccia found in caves, he remarked that in the hands of geologists they would teach much; they were the sulphate of lime, or alabaster, which was used extensively for making plaster of Paris, and had been used from the time of Nineveh for the making of cement. Dr. Kalmuck had promised to describe the specimens in this court, and he could only regret that indisposition had prevented his attendance.

Upon reaching the Brazilian court Mr. CLEMENT, at the request of Mr. Oliveira, explained the heavier specimens. He remarked that the whole formation met with there was the Lower Silurian, but it was upon a very exaggerated scale, the formation being similar to that which he had referred them to in speaking of the Welsh gold formation. Silica, potash, soda, &c., is found in the rocks, as in Wales, and amongst them the quartz veins run. The sulphides of iron and copper were met with, and also iron, with very little lead; but these metals were only met with in limited quantities. The specimens of veinstone with gold were very similar to that at Vigra and Clogau; it was nickeliferous pyrites, with gold in a blackish looking quartz as a matrix; he believed the gold would be found to be a true sulphide. Amongst the bismuth that comes to London there is much gold, and he believed many were now engaged in extracting it. The members had been examining a very fine specimen of amethyst crystals; he might tell them that they always considered the finding of these specimens to be indicative of the near approach to a deposit of silver, and this deposit was seldom three yards distant; for this reason they called these masses of amethysts mother of silver. They had copper in Brazil, very rich, as they would see from the very fine specimen of carbonate of copper exhibited, but it was not usually found in large quantities. The case of specimens from the Montes Aureos Mines were also very well worth inspection; the gold was found in a very large valley, 60 miles long, and 10 miles broad, in which the vein had never been discovered, the entire district being apparently equally auriferous. It was very similar to much of the Welsh quartz, especially that as Gogoddau, in South Wales, which he believed would make a good mine even yet.—The next case, containing the diamonds, beryls, emeralds, &c., was described by Prof. TENNANT, who observed that Mr. Clement had told them about gold, and he might have said something more about the quartz, which had this peculiarity, that it was so decomposed that it could be crushed between the thumb and finger. In Brazil the gold is quite as abundant as in Victoria; and the longer he lived the more was he convinced that in all gold-producing countries such stones as they would see in the case were being thrown away through the finders not knowing their value. One of these stones, though a black looking one, had been offered 600*l*. for by a gentleman who had a very large diamond in the Exhibition; when faceted that stone would form two good and large brilliant diamonds. The matrix in which diamonds are found in Brazil is the so-called cascalho, which is analogous to our plum-pudding stone. He would next show them a stone somewhat similar to the diamond—it was a white topaz, and the so-called diamond in the Portuguese Treasury, estimated to be worth 5,000,000*l*. sterling, was nothing more than a white topaz, and not worth as many farthings. His opinion that large diamonds were frequently thrown away or destroyed was, he thought, confirmed by the fact that he had frequently seen slices of diamond which would indicate stones larger than the Koh-i-noor. If they enquired how to distinguish the diamond from the topaz, he might tell them that it is simply necessary to remember that corundrum will scratch the topaz, but will be scratched by the diamond. There was a fine emerald exhibited, and also some beryls. He might tell them that the emerald and beryl are the same. The finest emerald in the Exhibition was that exhibited by Messrs. Hancock, and belonging to the Duke of Devonshire. The beryl is always striated, and the striæ formed a ready means of distinguishing them from rock crystal, the beryl having longitudinal striæ, whilst in the quartz they were always transverse. Before leaving the court he would direct their attention to a substance which, he believed, at no distant time might revolutionise the coal trade; it was found in Brazil in large quantities; it burnt well, and yielded a very excellent mineral oil. It appeared to be rich bituminous schist.

The very attractive collection exhibited from Russia in the nave, showing the application of jasper, chalcedony, garnets, lapis lazuli, jade, malachite, &c., to ornamental purposes, was next described by Mr. JAMES RUSHFORTH, the most interesting article being the casket with minerals—ornaments representing various fruits. The grapes are of nephrite, the ripe gooseberries of cornelian, the green gooseberries of quartz, the barberries of coral, and the raspberries of "rhodonotine," which appears to us to be a kind of magnanese spar. The whole collection forms part of the cabinet of the Emperor. The company then visited the Norway and Sweden courts, where Prof. Tennant briefly described some iron pyrites, phosphates of lime, specimens of silver, granites, porphyries, serpentines, &c., and pointed out a fine specimen of Silurian limestone, with sections, orthoceras, or straight horn in it. He described the orthoceras as a straight nautilus, which lived in the Silurian period, and which was provided with air cells very similar to those of the living nautilus. The Commissioner of this court kindly offered to allow the closer inspection of the Kongsberg silver ores; but the arrangements previously made not having been kept strictly within time limits prevented the civility being availed of, as was intended. Mr. Osborne gave a short account of the mode of extracting silver at Kongsberg. He explained that the native silver was melted in a small reverberatory furnace, and suggested that the same plan should be tried in the treatment of gold. The emeralds, garnets, rock crystal, rock salt, coal, and deposits of calcareous tufa in the Austrian department, which figured next in the programme, were passed by almost without notice, it being already beyond the time appointed for the meeting in the Zollverein mineral department.

The visit to the Zollverein department was undoubtedly the most interesting portion of the day's proceedings; the collection being admirably and systematically arranged, and well understood by the gentleman entrusted with them,—Dr. HERMANN WEDDING, who spared no effort to make the inspection of it interesting. The description was even more interesting than the collection itself, from the lucid and intelligible manner in which the address was delivered—more in the style of an old and practised orator, than of a young man certainly not over thirty. He commenced by describing the very exellent geological map (prepared by Mr. Von Dechen, of Bonn), of Westphalia, and the northern part of Rhenish Prussia. The whole of the central portion of the district was of Lower Devonian age, and the "lenne schiefer," or Middle Devonian, went on even to the other side of the Rhine; being only intersected by the tertiary just in the valley of that river. The Coblentz sandstone was interesting from the value of its spathose iron, galena, and zinc ores. The coal went far under the cretaceous beds shown in the upper portion of the map, and the coal basin of the Rivers Jude and Worm were interesting by their difference. The tertiary formations often contained also much lignite. He would next direct their attention to the map of the coal basin of the Ruhr, from which they would see how the coal extended, as he had said, not only to the Rhine, but on the other side of it. The next plan was important, as showing where the new ironstone beds in the Teutoburger Wald Mountains were found; and next was the sections of the coal fields near Aix-la-chapelle. He might tell them that under the tertiary the coal beds were bituminous near the surface, and anthracitic lower down. At the limits of the coal measures and limestone and slate and limestone, important deposits of zinc ore were found. From the special section of the Westphalian coal fields they would see that the coal formations extended under the cretaceous. The seams run in saddles, and were very numerous; but the greatest portion of the whole formation being below the cretaceous, it was necessary that all the pits should be well tubbed, to avoid inconvenience from the water. Unfortunately, there are only small beds of ironstone, so that in England we had the advantage near the corresponding formations. The Lobejun coal field was especially interesting, from the extraordinarily contorted form in which the seams occurred. The Stafafurt salt springs were formerly worked by pumping simply, but within the last ten years a pit had been sunk through the bunter beds, and the rock salt more than 100 feet thick was met with. Recently, a pit was sunk at Erfurt with equal success, but this was in the true trias. The last plan which he would show them was a chromographic representation of the yield and vend of coal in Prussia. The different colours represented the different coals; the colours being all to scale, the amount of each coal sent to each place could be at once ascertained. They would remark the large quantity of English coal which went to Berlin, nearly the whole being, of course, from Durham and Newcastle, as there was then water carriage only. They would see, in the same manner, the distribution of the coals of Westphalia, Saarbruck, and Upper Silesia. Since 1861 much Westphalian coal had found its way to Berlin, and he trusted the amount sent there would continue to increase. In Silesia they had the largest coal measures in Europe; the beds there are thick and flat, and nearly like those of South Staffordshire. There is some little difficulty, however, in fully developing them, owing to the Prussian portion being between parts of Russia and Austria, and for the present the duties are too high. The muschelkalk beds are important for the deposits of zinc. He next directed attention to the Riesengebirge, which he reminded them were 5000 ft. high, composed principally of crystalline slate and granite, and to the copper bed in the Zechstein, of Prussian Saxony, where the kupferschiefer, or copper-slate, was worked by the Mansfeldt Company. Dr. Wedding then proceeded to describe the ores and minerals. On the Inde the coals had long been worked by the Eschweiler Company. One particular feature to which he would direct their attention was the use of glass sieves for washing the coal; it was found that the sulphuric acid in the coals had a powerful action on the wire, so they had substituted glass, which they found to answer admirably. In the Ruhr basin they raised an iron ore, which was found from the large amount of phosphor, sometimes from 12 to 20 per cent., which it contained to be quite unfit for making iron; attention was, therefore, directed to the phosphor, and it was discovered that by calcining and decomposing it with acid it could be converted into a valuable manure. He would next call their attention to the lime-cokes, or coke obtained from small coal and lime, the object of which was to enable iron ores to be smelted without other flux. Just above them were some interesting specimens of brown coal, which they would see was of three distinct characters—the earthy, the woody, and the lamellar; the latter was very rich in paraffin, and the woody yielded an excellent charcoal. The spathose iron ores would next claim their attention; they were very interesting, as being the ore from which the well-known spiegeleisen was obtained; the spiegeleisen having recently been imported into England for the manufacture of steel. They had black-band ores, but they were not very large or rich; and claybands also, which gave iron of excellent quality. The lead ores were mostly found in the same strata as the spathose iron ores, and he would especially direct their attention to the specimens of argentiferous galena. There was also a good specimen from the bunter beds; they could see distinctly the little grains of galena in the sandstone, and they could find a seam 120 ft. thick of the same kind. They had many zinc ores, both as blende and calamine, and the

various processes for separating the metal were represented. Amongst the copper ore, perhaps the most interesting specimen was the fahlerz, which was rich in silver, and the poor ores containing copper, blende, and galena; all are separated with success. Some ores are treated with sulphuric and the poorer with hydrochloric acid. The process has been long in use, and it is found that ore containing only ⅛ per cent. of copper leaves a good profit. The manganese ores, as they would see, were well worthy of attention, and the building stones, slates, and marbles, represented by the specimens exhibited, were found in large quantities. Upper Silesia had some excellent calamine, there being, as they would see, two distinct kinds—the red and the white; the latter was the best, the red being sometimes too much mixed with iron. To turn to the metallurgical products, they would find some exceedingly fine specimens of spiegeleisen, some of which was the more interesting, being manufactured with coke instead of charcoal, and they should also examine the spring of cast-iron direct from the blast-furnace. The lead, zinc, and iron from the Concordia Works, near Eschweiler, were worthy of observation, because the metals were all together in the ore, and were obtained with a large profit. With regard to the spiegeleisen, he should tell them that it was usually found that the larger the quantity of manganese contained the larger were the facets of the crystals obtained. The bar of selenium was probably the largest ever exhibited; it was obtained from the copper smoke, a sample of which was also exhibited. The nickel and cobalt exhibited were principally from Nassau and Westphalia, and they had also some fine specimens of cadmium in the metallic state. The next case of which he would ask their inspection was one containing some small samples of gold. In former times there were arsenic works in Silesia, and in the residua from the arsenic manufacture Plattner discovered gold, and the gold is still extracted. The residua are first treated with chlorine, and the gold extracted. The gold was not obtained in large quantities, but it was interesting, as the ring used at the marriage of the Princess Royal and the Prince of Prussia was made of it. The copper products from the Mansfeldt works were very interesting, and even to the works themselves much interest attached, from the fact that the discoveries both of Augustin and Ziervogel were made there. The doctor concluded his address by describing the very beautiful specimens of paraffine exhibited by Dr. Bernhard Hübner, and which are so treated as to melt at various temperatures, according to the purposes for which they are to be used.

The thanks of the Association having been given to Dr. Wedding for his very entertaining discourse, the party separated.

YORKSHIRE ORES.—In Class I., No. 35, are exhibited some fine specimens of lead ore, and a mass of rich copper ore from Richmond, Yorkshire. The *Times* says, in reviewing the minerals of this class:—"The copper ores shown by Mr. Bradley, from Richmond, No. 35, are worthy of attention, as coming from a newly-discovered locality. They consist of vitreous copper and blue and green carbonate." It may be interesting to the public to learn the analysis of the ore thus commented on by the *Times*. We believe it is of superior yield to most of the ores found in England, if not even to that from the rich mines in South America or Australia. It is thus given, attached to the specimens exhibited:—

Disulphide of copper	54·08
Protoxide of copper (black oxide)	29·35
Carbonic acid	9·23
Water	4·30
Sesquioxide	1·00
Insoluble residue (argillaceous matter)	1·63
	98·59
Loss in assaying	1·41 = 100·00
Metallic copper per cent.	65·83

Silver per ton, 17 ozs. 2 dwts. 18 grs.

It is remarkable that the ore is found in the same stratum as the South Australian copper—in the limestone formation—which in this country chiefly abounds in lead ore. The copper ore is deposited in veins in the rock not far from the surface, and is consequently easy to win. Large quantities of this ore have been found at Merribent, the property of Mr. C. L. Bradley, between Melsonby and Middleton Tyas. At the latter place there were extensive copper mines, which were worked for a considerable period in the early part of last century. It will be in the memory of some persons still living that the plant used in carrying on this mine—including a powerful engine and other appliances—was sold about the year 1796. A portion of the chimney, &c., is still to be seen near the church. It is supposed the works were discontinued in consequence of the excess of water. We understand that arrangements are being made to work the copper of this district on a very extensive scale, and we wish the spirited adventurers every success.

MINING ENTERPRISE IN AUSTRALIA.—The attention that has been given latterly by Melbourne investors and speculators to the Ballarat mines is becoming almost as furious as in the mining mania of 1859. Shares in many of the investments are changing hands at prices, though fabulously high, still within their value. Others, again, are quoted at rates far beyond what the present prospects of the mines would reasonably warrant. We give a list of the market value of shares in a few of the Ballarat companies, according to sales that have taken place during the past month:—A working half-share in the Koh-i-noor Company, 1100*l.*, a sleeping half, 1500*l.*; making the full share 2600*l.*, or the value of the mine 104,000*l.* In the Extend a working half, 1100*l.*, and 1475*l.* for a sleeping half, or 206,000*l.* for the whole mine. Four full working shares in the Albion Company changed hands at 1400*l.* each, or an estimated value of the whole mine of 100,800*l.* Cosmopolitan, full share, 1400*l.* The Great Republic Company having struck a rich lead one day last week, shares in this mine, that would not realise the week before 180*l.*, found ready purchasers at from 1000*l.* to 1100*l.* The mine thus rose in value from 14,400*l.* to 88,000*l.* in the short space of a week, and this advance was not without some reason, the gutter having been proved to be rich from both of their shafts, that are distant from each other about 700 ft. From one and a half machines of dirt no less than 355 ounces of gold were obtained. The opportunity for speculation was not lost sight of, and shares have been dealt in freely. That Melbourne speculators should be tempted to dabble in mining shares, where such splendid prizes were constantly turning up, is not at all to be wondered at.

The PORT PHILLIP COMPANY crushed 2762 tons of quartz, which yielded 2288 ozs. 2 cwts. 12 grs. of bar gold, averaging per ton 16 dwts. 13 grs. They are fitting up an arastra—a machine for reducing quartz tailings to an almost impalpable paste. The bed used for the experiment is one of the Chilian basins, in which are placed two large blocks of Mount Beckworth granite, dressed to suit the curves. These stones do not revolve, but are drawn round like harrows in a puddling machine. The application of this machine, although it may be new in this colony, has been in use for a century or more—yet I learn that an attempt has been made by another party to claim a patent for it. The object of the company is to test it against Mr. Hinck's patent, alongside of which it is placed. Other experiments for the retention of the very fine gold are being made, the results of which will be furnished by the company so soon as a satisfactory issue is secured. The hydraulic stone-breaking machine is being worked as occasion requiries—about three or four days per week. The alterations for feeding the machine and delivery of the reduced metal to the battery passes are now complete. From the upper tramway a shoot conveys the large stone direct. An engine of 12 horse-power works the machine, which is fitted with a swinging jaw, hinged on the centre. This is worked by a double-action pump, the main feature of which is that all the water used returns to the cistern, and is used over again. The action is very rapid. The large blocks of quartz are partly broken by contact with the upper jaw—the receding motion allows it to pass to the lower jaw, to be instantly reduced to a size adapted for the batteries. Another shoot receives and conveys it into the delivery trucks placed below. From thence it is run to the passes. I hear that hard steel jaws will shortly be applied, the company being satisfied of the utility of the machine. The whole of the tramways are laid with railway iron. The portable hydraulic ram is on the same principle, as regards the return of water. They were designed by Mr. Rees Davies, engineer to the company. The ram is capable, by hand power, of raising 30 tons, or even more. The tramway department is complete. The economical use of steel stamp-heads is not definitely settled, but the manager speaks favourably of them.—Mr. Hinck, the patentee of an invention to secure fine gold from quartz tailing, has formed a company, and has erected two large machines for pulverising the debris from the crushing mills and deposits in the creek. The present engine is of 6-horse power, and the arrangements are nearly completed. The VICTORIA COMPANY crushed for the month 421 tons 13 cwts., which yielded 262 ozs. 15 dwts. of gold.

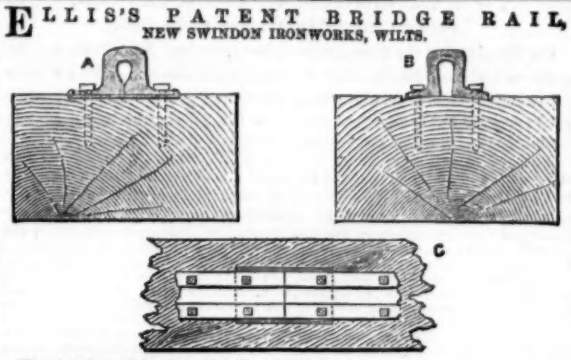
THE PETROLEUM TRADE.—Among the articles of produce which have experienced a rapid rise lately is the petroleum or American rock oil. About four months back the quotation was 9*l.* per ton, and it is now between 16*l.* and 18*l.* This is attributed partly to the rapid increase of its use as an illuminator, and partly to the value of the turpentine extracted from it. Present prices, it is said, are ample to attract a steady supply, and in the course of the present month the facilities for its transportation will be greatly augmented by the completion of a branch of the Atlantic and Great Western Railway to the centre of the principal district of production, whence it will then be possible to send it to New York direct without any break of communication.

GIGANTIC IRON CASTING.—Referring to the huge anvil block, weighing from 35 to 38 tons, cast by Messrs. Fawcett, Prestor, and Co., Liverpool, for a steam-hammer, to melt which two air-furnaces and two cupolas were engaged, the quantity of iron melted being 40 tons—the time required to cast, from opening the furnaces, being less than a quarter of an hour, a correspondent of the "Journal of the Franklin Institute" says—"This was a heavy undertaking, and doubtless the large number of ladies and gentlemen who assembled to witness the operation of casting were highly gratified at the beautiful spectacle. In a mechanical point of view, however, the casting of a similar piece at the Port Richmond Ironworks, Messrs. I. P. Morris, Towne, and Co., on July 1, shows a much greater capacity for doing this description of heavy work. The block weighs 31 tons, and to pour it 37½ tons of metal were melted in one cupola in four hours from the time the blast was put on. The quantity of air used in the blast was 4000 cubic feet per minute. The coal consumed was 1 lb. for each 9 lbs. of iron melted. The mould was filled in four and a half minutes pouring. The work was done with the ordinary resources of the establishment, and without any display or assemblage of visitors."

CRYSTALLISATION OF IRON.—As it has often been asserted that a bar of fibrous iron, by being nicked all round, acquires a crystalline nature from the effects of concussion, the following experiment may not be uninteresting:—A short bar of 1½-in. square iron was cut into three lengths. The first piece was nicked on one side, and broken by 30 or 40 blows from a sledge-hammer, showing a fibrous silky fracture. The second was nicked on all four sides, and broke off short with about six blows, the fracture presenting a crystalline appearance. The third piece was nicked all round similarly to the second; it was then placed in a planing machine, and a portion of its surface equal to the depth of the nick taken off three sides, leaving a nick on the one side only. Thus, instead of breaking crystalline, as it would have done if the concussion of the blow had had any effect upon it, it broke very strongly, with a fracture exactly resembling No. 1. This result appears to show that nicking does not alter the texture of a bar of iron, but, by determining the direction of the fracture, causes the fibre to break off short, presenting a crystalline appearance.—J. H. P.: *Wolverhampton.*—*Engineer.*

NEW PROPELLING POWER.—On the Scheldt, near Antwerp, experiments have been made with a river-boat, provided with a new propelling power, which has been recently discovered. The boat has neither paddle-wheels nor screw. In the middle of it, however, is a cone-shaped kettle, into which the water is pumped up, and from which it is driven out with great force into the river, through two curved boxes on the side of the boat, by which means the vessel is propelled forward with great swiftness. By simple machinery the arrangements of the boxes can be so altered that the boat can be turned immediately, and steered in any direction. The experiments made with this boat, which is intended to ply between Luik and Seraing, have far exceeded expectation, and will, perhaps, cause a revolution in the means of propulsion. The new system, which has been discovered by a German, one Mr. Selber, can be very well applied to large vessels.—*Dutch paper.*

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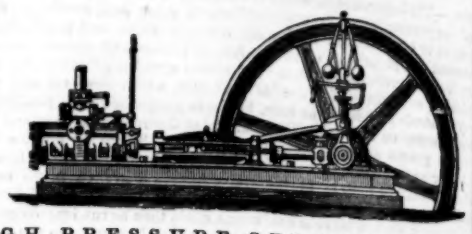
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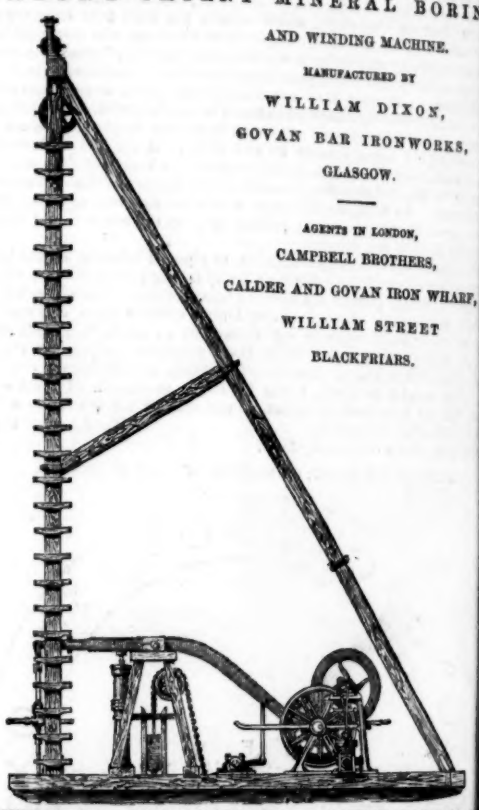
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